

PATENT ABSTRACTS OF JAPAN

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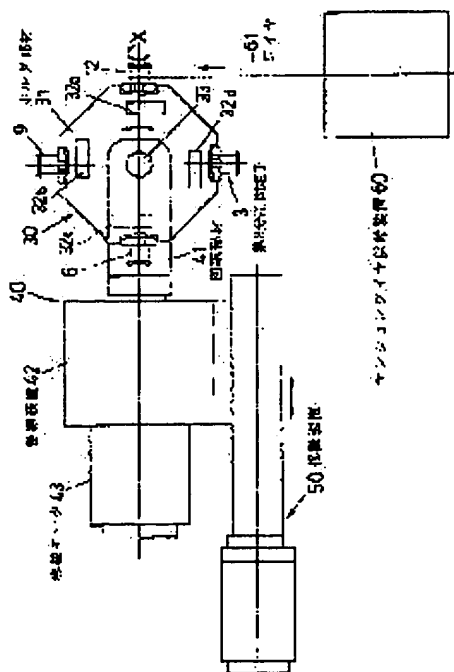
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(54) MANUFACTURING METHOD AND DEVICE FOR STATOR

(57)Abstract:

PROBLEM TO BE SOLVED: To continuously wind the crossover line of split stators which the same phase.

SOLUTION: Four split stators, having the same phase are attached to a holder member 31 radially with a teeth part facing outward, one of which is rotated around an axial line X by a winding motor 43 and undergoes winding by oscillating movement in the direction of the axial line X by an oscillating device 50. With a winding starting wire and a winding ending wire being held in a wire clasper 32a, the holder member 31 is turned around an index shaft 33 by 90 degrees in the clockwise direction, a crossover line is sequentially wound continuously on four split stators, the winding ending line is cut, and the split stator is removed. Likewise, split stators of two other phase undergo winding before being removed. The three phases thereof are layered so as to be displaced at even intervals and formed into an integrated stator by rounding them with the teeth parts facing inwardly.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the manufacture approach of the stator of a brushless motor and manufacturing installation which are used by the three-phase motor, especially household electric appliances, an automobile, etc.

[0002]

[Description of the Prior Art] For example, when it divides one pole of stators of an inner rotor at a time and they carry out a coil, even if few per pole, two lead wire arises. Therefore, after arranging so that the crossover for every phase may be insulated, respectively in case each division stator is installed in the shape of a periphery and one stator is constituted conventionally, he was trying to connect the crossover between inphases.

[0003]

[Problem(s) to be Solved by the Invention] However, if it was in the manufacture approach of such a conventional stator, it is difficult to process a crossover with coil equipment like the manufacture approach of the stator of one apparatus, or the stator of an expansion mold, and the man day of connection increased, and when it was going to automate these processings, there was a trouble that a facility became cost quantity.

[0004] This invention is made in view of the above-mentioned point, and it aims at offering the manufacture approach of a stator also with easy arrangement of a crossover in which a coil is possible, and a manufacturing installation in the manufacture process of the stator of the usual assembled die, without cutting the crossover for every phase.

[0005]

[Means for Solving the Problem] In the manufacture approach of the stator which divides one pole of stators of a three-phase motor at a time, and carries out a coil in order that this invention may attain the above-mentioned purpose For every U phase, V phase, and W phase, carry out a slot side outside and each division stator is arranged in a radial at equal intervals, respectively. After making the crossover of a interphase continue and carrying out a coil one by one, a phase can be shifted, respectively, a laminating is carried out so that the division stator of each phase which carried out the coil may become at equal intervals, and the manufacture approach of the stator which rounds off all division stators in the shape of a periphery so that an opening slot side may become inside is offered.

[0006] And in the manufacture approach of the above-mentioned stator, it is good to contain into the receipt slot for every phase which formed the crossover for every above-mentioned phase in the insulator of the above-mentioned division stator, and to insulate mutually by changing the location of the direction of a stator axis of the crossover for every phase which carried out the laminating, respectively, and rounding off all division stators.

[0007] Moreover, it sets to the coil equipment of the stator which divides one pole of stators of a three-phase motor at a time, and carries out a coil. A slot side is carried out outside for each division stator for every U phase, V phase, and W phase, respectively. The holder member which can be freely detached

and attached at equal intervals to a radial, The manufacturing installation of the stator which established a rotation means to rotate this holder member around the axis of the division stator which is going to carry out a coil, a **** means to make it **** in the above-mentioned axis direction, and the index rotation means that carries out predetermined include-angle rotation in the same flat surface is also offered.

[0008] And as for a holder member, in the manufacturing installation of the above-mentioned stator, it is desirable to approach the stowed position of a division stator and to make it have the clamp section which can hold lead wire and a crossover, respectively.

[0009] It becomes possible for a coil to become possible, without cutting the crossover between inphases for every division stator by processing as mentioned above, for a manufacture man day to decrease sharply, and for the manufacture approach of the stator by this invention to raise productivity sharply. Moreover, the manufacturing installation of the stator by this invention can perform the coil which the crossover was made to follow with a very easy configuration using the stator of an assembled die as usual by constituting as mentioned above.

[0010]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is concretely explained based on a drawing. It is the block diagram showing 1 operation gestalt of the manufacturing installation of the stator according [drawing 1] to this invention, the top view in which drawing 2 shows the configuration of a division stator, and the explanatory view in which, as for drawing 3 , that side elevation, drawing 4 , or drawing 14 shows the production process of a stator, and the stator manufactured explains the case where it is three-phase-circuit 12 slot.

[0011] This stator 20 consists of the 1st which carried out the division-into-equal-parts rate to 12 pieces - the 12th division stators 1-12, as that last manufacture condition is shown in drawing 14 . For example, by the 1st, 4th, 7th, and 10th division stators 1, 4, 7, and 10, the 2nd, 5th, 8th, and 11th division stators 2, 5, 8, and 11 constitute V phase, and the 3rd, 6th, 9th, and 12th division stators 3, 6, 9, and 12 constitute W phase for U phase, respectively.

[0012] As shown in drawing 2 and drawing 3 as the representative, the 1st - the 12th division stators 1-12 the configuration of the 1st division stator 1 As it consists of insulator 1c which is the insulator of teeth section 1b and these which are iron core section 1a and the coil section, and one and is shown in the top face of this insulator 1c at drawing 2 The receipt slots 1f, 1g, and 1h which intersect perpendicularly with the axis X with which the receipt slots 1d and 1e parallel to a cut-water line and the axis X which winds and contains lead wire, such as an end line, contain each crossover of U phase, V phase, and W phase to a peripheral face as shown in drawing 3 are formed, respectively. In addition, since the 2nd - the 12th division stators 2-12 also consist of the same configuration as the 1st division stator 1, in being required, it attaches and shows the same suffix as the sign of each division stator, and those explanation is omitted.

[0013] As shown in drawing 1 among the division stators of every four plane 1 parts which consist of such configurations, the teeth section is carried out outside and the holder member 31 from which four division stators which constitute the phase of arbitration constitute the division stator maintenance means 30 is equipped at equal intervals at a radial so that the axis of each division stator may intersect perpendicularly. Each division stator stowed position is approached, respectively, and four wire clampers 32a, 32b, 32c, and 32d are formed in the holder member 31 as a cut-water line and the clamp section for winding and holding an end line.

[0014] It has the index shaft 33 which protruded on the core of front flesh-side both sides by drawing 1 , and the holder member 31 carries out predetermined include-angle index rotation by the index rotation motor which is not illustrated. This index shaft 33 is supported by the U character-like rotation member 41 free [rotation] from the front flesh-side both sides of the holder member 31. The rotation drive of the rotation member 41 is carried out to the direction indicated by the arrow by the coil motor 43 of the coil equipment 42 having a non-illustrated reducer etc. around the axis X of the division stator which is going to carry out a coil, and the rotation means 40 for the coils of a division stator is constituted by these.

[0015] Coil equipment 42 has a well-known ball thread etc., drives it in the direction of axis X at a longitudinal direction with the **** equipment 50 in which **** is possible, is made to **** the division stator which is going to carry out a coil through the holder member 31 in the direction of axis X, and it carries out an alignment coil with the wire 61 supplied from a tension wire or a feeder 60. In addition, although illustration is omitted in drawing 1, the wire guide which leads the gripper which holds a wire 61 temporarily, and a wire 61 to a coil location is prepared.

[0016] Next, the manufacture approach of a stator using the coil equipment which consists of the above configurations is explained with reference to drawing 4 thru/or drawing 14. To first, the holder member 31 made to **** at a going-rightward edge with the **** equipment 50 of drawing 1 It equips by ****ing outside the teeth section which is a slot side about the 3rd, 6th, 9th, and 12th division stators 3, 6, 9, and 12 for the plane 1 which constitutes W phase as shown in drawing 4. It considers as the condition which the cut-water line bent at the right angle of the wire 61 supplied from the tension wire feeder 60 is deposited with wire clasper 32a through 12d of receipt slots of the 12th division stator 12 which carries out a coil first, and shows it in drawing 5.

[0017] Rotating the 12th division stator 12 around Axis X through the holder member 31 from this condition, by the rotation member 41, as shown in drawing 6, the holder member 31 is made to **** to a left with **** equipment 50, and a coil is formed in teeth section 12b. After a coil is completed, it winds, an end line is deposited with wire clasper 32a through receipt slot 12e, and a crossover is formed.

[0018] Then, make it rotate 90 degrees to a clockwise rotation by the index rolling mechanism whose holder member 31 is not illustrated, the 9th division stator 9 of 2 coil eye is made to shift to a coil location, and the cut-water line (crossover) is deposited with 9d of receipt slots through wire clasper 32b. The 9th division stator 9 is made to **** to a going-rightward edge through the holder member 31 in parallel to this with the **** equipment 50 shown in drawing 1, and the coil attitude of 2 coil eye is prepared (refer to drawing 7).

[0019] After repeating the same coil procedure, performing the coil of the 9th, 6th, and 3rd division stators 9, 6, and 3 one by one hereafter and completing the coil of the 3rd division stator 3 of 4 coil eye (i.e., if the coil for w phase plane 1 is completed), it winds, and an end line is deposited and cut to wire clasper 32d through receipt slot 3e (refer to drawing 8).

[0020] In this condition, it changes into the condition which the 3rd, 6th, 9th, and 12th division stators 3, 6, 9, and 12 are removed from the holder member 31, and shows in drawing 9, without breaking down arrangement into the configuration list of the 3rd, 6th, 9th, and 12th division stators 3, 6, 9, and 12 and each crossover of W phase, and lead wire (cut-water line and winding end line).

[0021] The coil of the 2nd, 5th, 8th, and 11th division stators 2, 5, 8, and 11 which remain similarly and constitute a part for two phases, V phase, and U phase, and the 1st, 4th, 7th, and 10th division stators 1, 4, 7, and 10 is created, and as shown in drawing 10 and drawing 11, the laminating of the division stator of V phase and U phase is carried out one by one on the division stator of W phase. At this time, it considers as an intersection and the condition that the iron core of each division stator touches mostly mutually, at the include angle whose axis of the adjacency ***** stator of the order of the 1st - the 12th division stators 1-12 is 30 degrees, respectively.

[0022] Moreover, as shown in drawing 11, it puts one by one from what has the location of the stator shaft orientations (direction perpendicular to space) of the lead wire in the cut water of the division stator of each phase, and the end of a volume, and a crossover close to an iron core. That is, V phase (2, 5, 8, 11) is carried out on W phase (3, 6, 9, 12), and the laminating of the U layers (1, 4, 7, 10) is carried out on it.

[0023] Subsequently, as the division stator which carried out the laminating is shown in drawing 12 along a flat surface (flat surface parallel to space) perpendicular to a stator axis, it develops on a straight line. Crossover 61u of U phase by which the laminating was carried out to the upper case by this As the crossovers 61v and 61w of V phase and W phase counter the receipt slots 2g-11g of the middle and the lower berth, and 3h-12h, respectively and it is shown in the receipt slots 1f-10f of the upper case of each division stators 1-12 shown in drawing 13 at drawing 14 By making the iron core section into a

periphery side, namely, carrying out an opening slot side inside, and rounding off in the shape of a periphery centering on a stator axis C, it is contained by receipt Mizouchi of each stage and a interphase insulation is made easy.

[0024] In addition, although it was made to perform a coil coil by rotating each division stator around that axis with the above-mentioned operation gestalt, even when performing a coil coil by fixing a division stator and making it circle in a flyer, it is possible to carry out this invention convenient at all.

[0025]

[Effect of the Invention]

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CLAIMS

[Claim(s)]

[Claim 1] In the manufacture approach of the stator which divides one pole of stators of a three-phase motor at a time, and carries out a coil Carry out a slot side outside for every division stator U phase, V phase, and W phase, respectively, and it arranges in a radial at equal intervals. The manufacture approach of the stator which can shift a phase, respectively, carries out a laminating so that the division stator of each phase which carried out the coil may become at equal intervals, after making the crossover of a interphase continue and carrying out a coil one by one, and is characterized by rounding off all division stators in the shape of a periphery so that an opening slot side may become inside.

[Claim 2] The manufacture approach of the stator according to claim 1 characterized by containing into the receipt slot for every phase which formed the crossover for said every phase in the insulator of said division stator by changing the location of the direction of a stator axis of the crossover for every phase which carried out the laminating, respectively, and rounding off all division stators, and insulating mutually.

[Claim 3] In the manufacturing installation of the stator which divides one pole of stators of a three-phase motor at a time, and carries out a coil A slot side is carried out outside for each division stator for every U phase, V phase, and W phase, respectively. The holder member which can be freely detached and attached at equal intervals to a radial, The manufacturing installation of the stator characterized by establishing a rotation means to rotate this holder member around the axis of the division stator which is going to carry out a coil, a **** means to make it **** in said direction of an axis, and the index rotation means that carries out predetermined include-angle rotation in the same flat surface.

[Claim 4] A holder member is the manufacturing installation of the stator according to claim 3 characterized by approaching the stowed position of a division stator and having the clamp section which can hold lead wire and a crossover, respectively.

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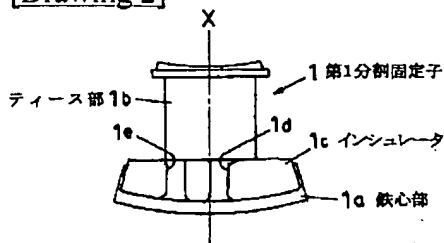
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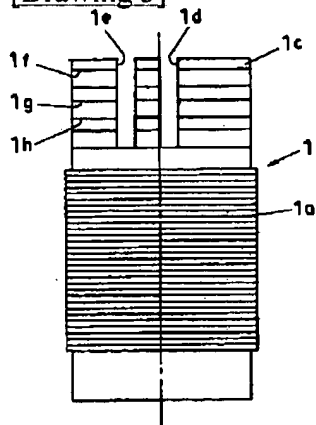
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DRAWINGS

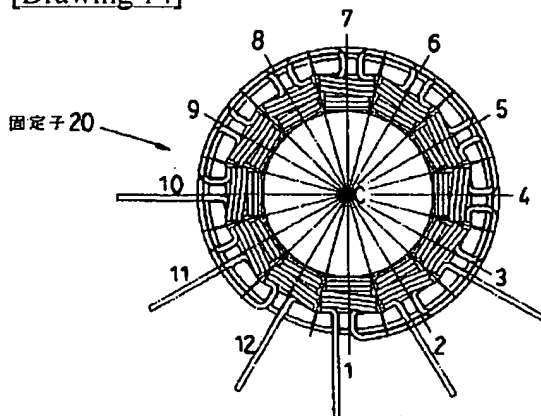
[Drawing 2]



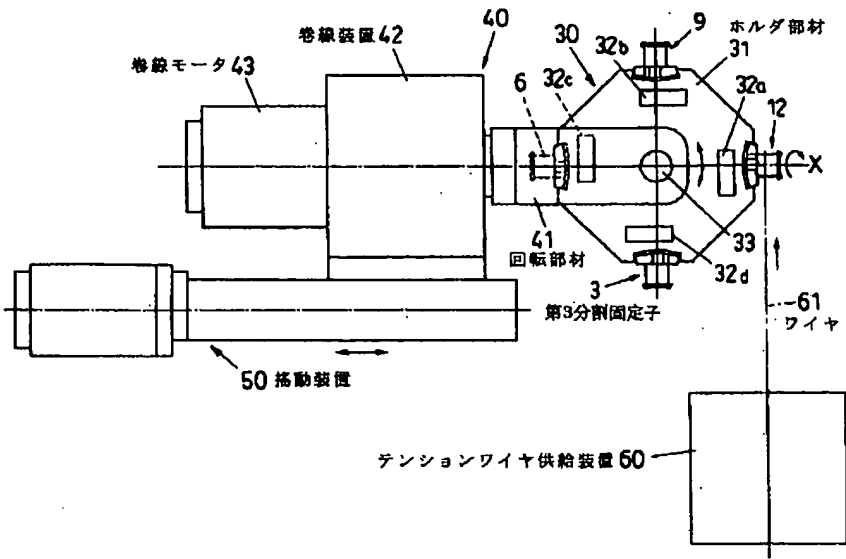
[Drawing 3]



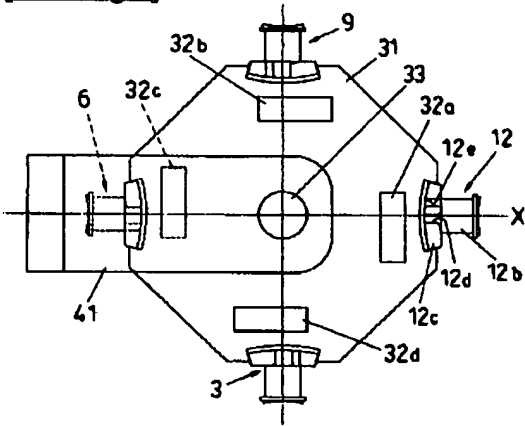
[Drawing 14]



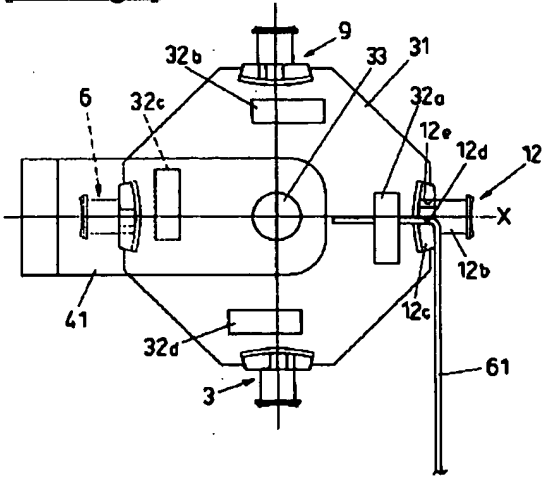
[Drawing 1]



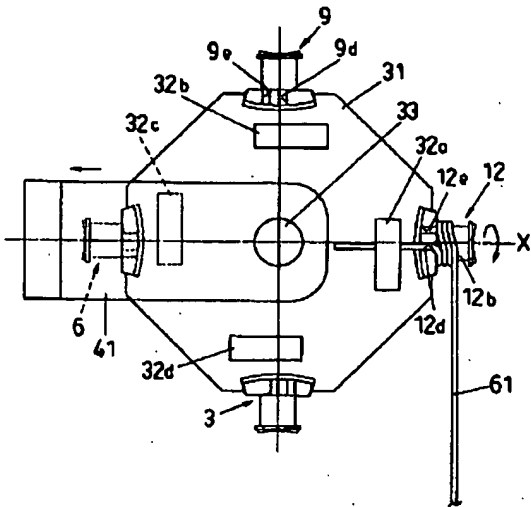
[Drawing 4]



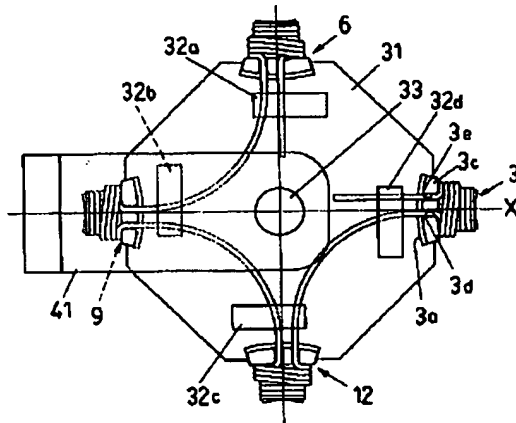
[Drawing 5]



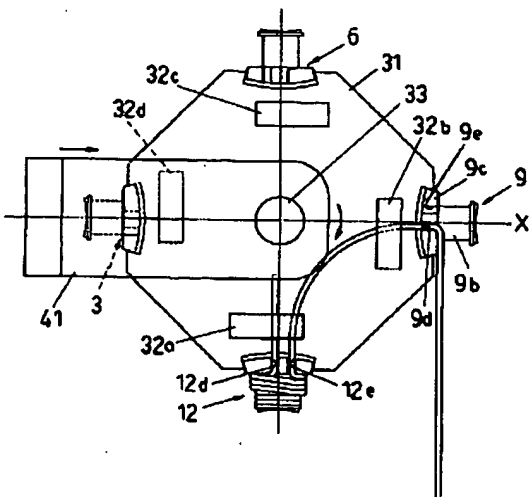
[Drawing 6]



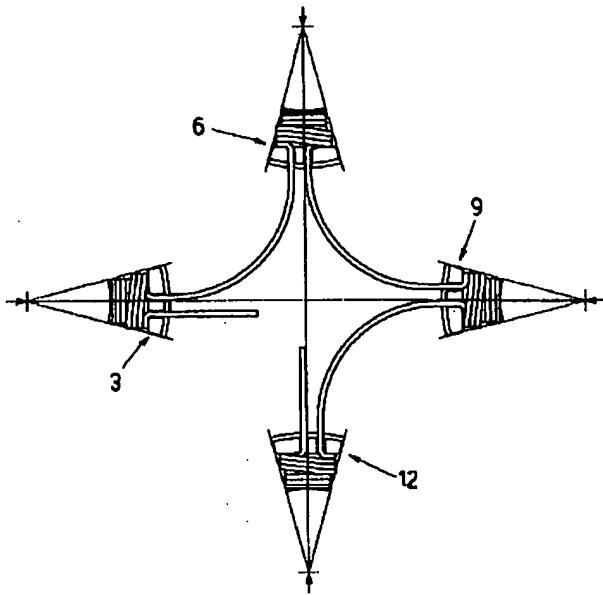
[Drawing 8]



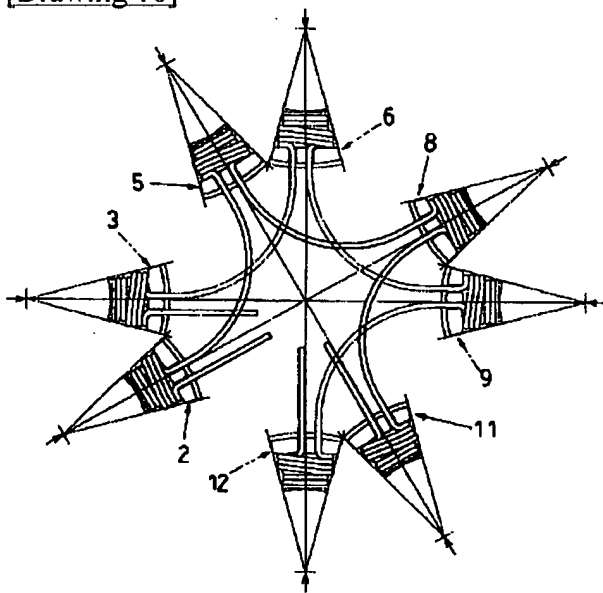
[Drawing 7]



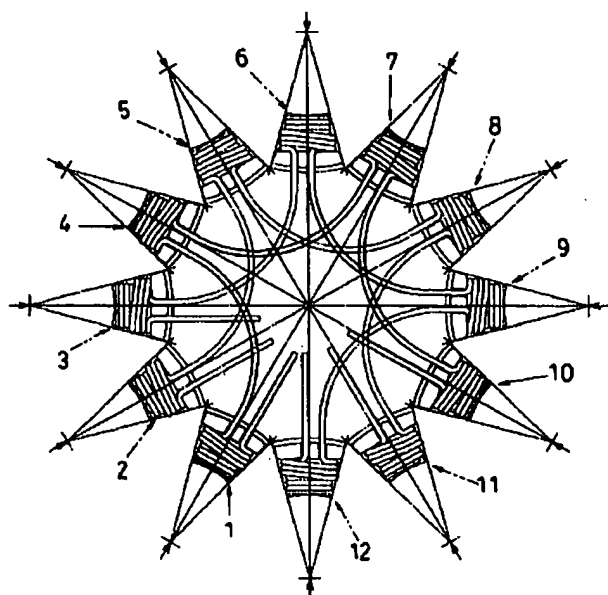
[Drawing 9]



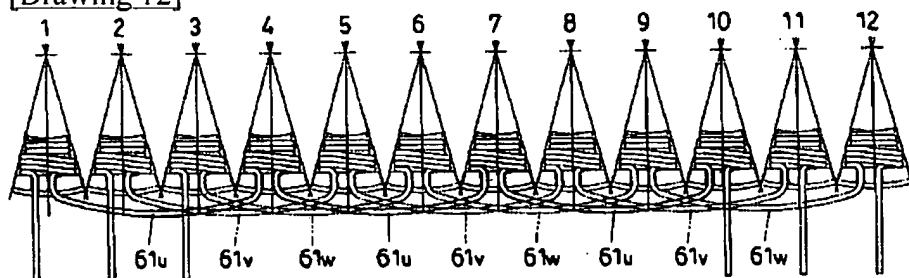
[Drawing 10]



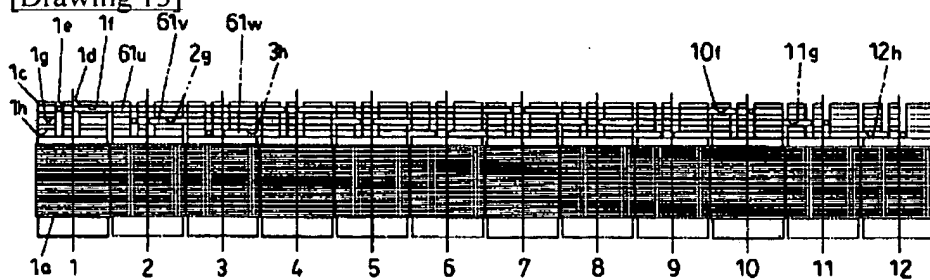
[Drawing 11]



[Drawing 12]



[Drawing 13]



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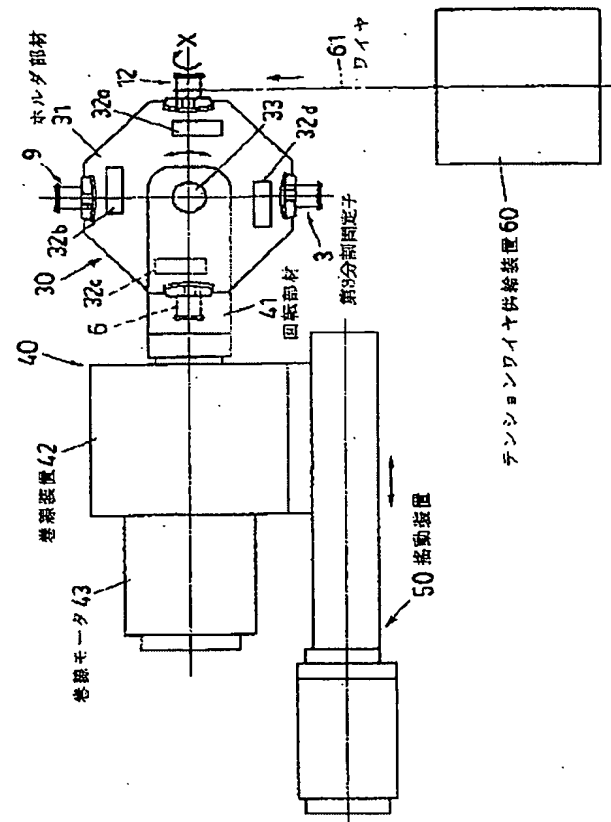
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APPLICANT : ODAWARA ENGINEERING CO LTD;

INVENTOR : ISHIGURO KUNITOMO;

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H02K 3/52

TITLE : MANUFACTURING METHOD AND
DEVICE FOR STATOR



ABSTRACT : PROBLEM TO BE SOLVED: To continuously wind the crossover line of split stators which the same phase.

SOLUTION: Four split stators, having the same phase are attached to a holder member 31 radially with a teeth part facing outward, one of which is rotated around an axial line X by a winding motor 43 and undergoes winding by oscillating movement in the direction of the axial line X by an oscillating device 50. With a winding starting wire and a winding ending wire being held in a wire clumper 32a, the holder member 31 is turned around an index shaft 33 by 90 degrees in the clockwise direction, a crossover line is sequentially wound continuously on four split stators, the winding ending line is cut, and the split stator is removed. Likewise, split stators of two other phase undergo winding before being removed. The three phases thereof are layered so as to be displaced at even intervals and formed into an integrated stator by rounding them with the teeth parts facing inwardly.

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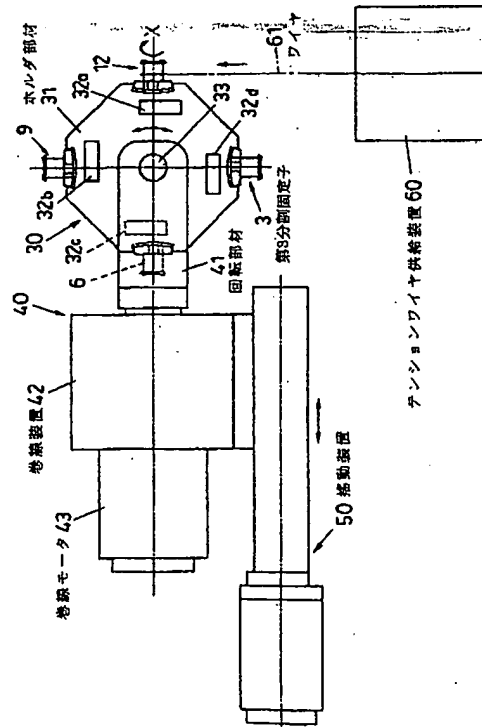
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(54) 【発明の名称】 固定子の製造方法及び製造装置

(57) 【要約】

【課題】 同相の分割固定子の渡り線を連続させて巻線する。

【解決手段】 ホルダ部材31に同相の4個の分割固定子をティース部を外側にして放射状に装着し、その一つを巻線モータ43により軸線Xの回りに回転させ、揺動装置50により軸線X方向に揺動させて巻線し、巻き始め線及び巻き終わり線をワイヤクランパ32aに預け、ホルダ部材31をインデックス軸33の回りに90度ずつ時計方向に回転させ、4個の分割固定子に渡り線を連続させて順次巻線した後、巻き終わり線を切断して取り外す。同様に他の2相の分割固定子を巻線して取り外し、3相を位相をずらせて等間隔に積層した後、ティース部を内側にして丸めて一体の固定子を形成する。



【特許請求の範囲】

【請求項1】 3相モータの固定子を1極ずつ分割して巻線する固定子の製造方法において、各分割固定子U相、V相、W相毎にそれぞれスロット側を外側にして放射状に等間隔に配設し、相間の渡り線を連続させて順次巻線した後、巻線した各相の分割固定子が等間隔になるようにそれぞれ位相をずらせて積層し、オープンスロット側が内側になるように全分割固定子を円周状に丸めることを特徴とする固定子の製造方法。

【請求項2】 積層した各相毎の渡り線の固定子軸線方向の位置をそれぞれ異ならせ、全分割固定子を丸めることにより、前記各相毎の渡り線を前記分割固定子のインシュレータに形成した各相毎の収納溝に収納して互いに絶縁することを特徴とする請求項1記載の固定子の製造方法。

【請求項3】 3相モータの固定子を1極ずつ分割して巻線する固定子の製造装置において、各分割固定子をU相、V相、W相毎にそれぞれスロット側を外側にして放射状に等間隔に着脱自在なホルダ部材と、該ホルダ部材を、巻線しようとする分割固定子の軸線の回りに回転させる回転手段と、前記軸線方向へ揺動させる揺動手段と、同一平面内で所定角度回転させるインデックス回転手段とを設けたことを特徴とする固定子の製造装置。

【請求項4】 ホルダ部材は、分割固定子の装着位置に近接してそれぞれ口出し線及び渡り線を保持可能なクランプ部を有することを特徴とする請求項3記載の固定子の製造装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、3相モータ特に家電や自動車等で使用されるブラシレスモータの固定子の製造方法及び製造装置に関する。

【0002】

【従来の技術】例えばインナロータの固定子を1極ずつ分割して巻線する場合は、1極につき少なくとも2本の口出し線が生じる。そのため、従来は各分割固定子を円周状に並設して1個の固定子を構成する際に、各相毎の渡り線をそれぞれ絶縁させるように整理した後、同相間の渡り線を結線するようにしていた。

【0003】

【発明が解決しようとする課題】しかしながら、このような従来の固定子の製造方法にあっては、一体型の固定子や展開型の固定子の製造方法のように渡り線の処理を巻線装置で行うことが困難であり、結線の工数が多くなり、これらの処理を自動化しようすると設備がコスト高になるという問題点があった。

【0004】この発明は上記の点に鑑みてなされたものであり、通常の分割型の固定子の製造過程において、各相毎の渡り線を切断することなく巻線が可能で、且つ、渡り線の整理も容易な固定子の製造方法及び製造装置を

提供することを目的とする。

【0005】

【課題を解決するための手段】この発明は上記の目的を達成するため、3相モータの固定子を1極ずつ分割して巻線する固定子の製造方法において、各分割固定子をU相、V相、W相毎にそれぞれスロット側を外側にして放射状に等間隔に配設し、相間の渡り線を連続させて順次巻線した後、巻線した各相の分割固定子が等間隔になるようにそれぞれ位相をずらせて積層し、オープンスロット側が内側になるように全分割固定子を円周状に丸める固定子の製造方法を提供するものである。

【0006】そして、上記の固定子の製造方法において、積層した各相毎の渡り線の固定子軸線方向の位置をそれぞれ異ならせ、全分割固定子を丸めることにより、上記各相毎の渡り線を上記分割固定子のインシュレータに形成した各相毎の収納溝に収納して互いに絶縁するのがよい。

【0007】また、3相モータの固定子を1極ずつ分割して巻線する固定子の巻線装置において、各分割固定子をU相、V相、W相毎にそれぞれスロット側を外側にして放射状に等間隔に着脱自在なホルダ部材と、このホルダ部材を、巻線しようとする分割固定子の軸線の回りに回転させる回転手段と、上記軸線方向へ揺動させる揺動手段と、同一平面内で所定角度回転させるインデックス回転手段とを設けた固定子の製造装置も提供する。

【0008】そして、上記の固定子の製造装置において、ホルダ部材は、分割固定子の装着位置に近接してそれぞれ口出し線及び渡り線を保持可能なクランプ部を有するようにするのが好ましい。

【0009】この発明による固定子の製造方法は上記のように処理することにより、同相間の渡り線を各分割固定子毎に切断することなく巻線が可能になり、製造工数が激減して生産性を大幅に向上させることが可能になる。また、この発明による固定子の製造装置は上記のように構成することにより、従来通りの分割型の固定子を用いてきわめて簡単な構成で渡り線を連続させた巻線を行うことができる。

【0010】

【発明の実施の形態】以下、この発明の実施形態を図面に基づいて具体的に説明する。図1は、この発明による固定子の製造装置の一実施形態を示す構成図、図2は分割固定子の形状を示す平面図、図3はその側面図、図4乃至図14は、固定子の製造工程を示す説明図であり、製造される固定子が3相12スロットの場合について説明する。

【0011】この固定子20は、図14にその最終製造状態を示すように、12個に等分割した第1～第12分割固定子1～12からなり、例えば第1、第4、第7、第10分割固定子1、4、7、10によりU相を、第2、第5、第8、第11分割固定子2、5、8、11に

よりV相を、第3、第6、第9、第12分割固定子3、6、9、12によりW相をそれぞれ構成している。

【0012】第1～第12分割固定子1～12は、その代表として第1の分割固定子1の構成を図2及び図3に示すように、鉄心部1aと巻線部であるティース部1b及びこれらと一体の絶縁体であるインシュレータ1cからなり、このインシュレータ1cの上面には図2に示すように、巻き始め線及び巻き終わり線等の口出し線を収納する軸線Xに平行な収納溝1d及び1eが、外周面には、図3に示すように、U相、V相、W相の各渡り線を収納する軸線Xに直交する収納溝1f、1g、1hがそれぞれ設けてある。なお、第2～第12分割固定子2～12も第1分割固定子1と同様の構成からなるので、必要な場合にはそれぞれの分割固定子の符号に同様の_SUFFIXを付して示し、それらの説明は省略する。

【0013】このような構成からなる1相分4個ずつの分割固定子のうち、図1に示すように、任意の相を構成する4個の分割固定子が、分割固定子保持手段30を構成するホルダ部材31に、各分割固定子の軸線が直交するように、ティース部を外側にして放射状に等間隔に装着される。ホルダ部材31には、各分割固定子装着位置にそれぞれ近接して、巻き始め線及び巻き終わり線を保持するためのクランプ部として4個のワイヤクランパ32a、32b、32c、32dが設けてある。

【0014】ホルダ部材31は、図1で表裏両面の中心部に突設したインデックス軸33を有し、図示しないインデックス回転モータにより所定角度インデックス回転する。このインデックス軸33は、U字状の回転部材41によりホルダ部材31の表裏両側から回転自在に支持されている。回転部材41は、不図示の減速機等を内蔵した巻線装置42の巻線モータ43により、巻線しようとする分割固定子の軸線Xの回りに矢示方向に回転駆動され、これらにより分割固定子の巻線用の回転手段40が構成される。

【0015】巻線装置42は、周知のボールねじ等を有して軸線X方向に揺動可能な揺動装置50により左右方向に駆動され、ホルダ部材31を介して巻線しようとする分割固定子を軸線X方向へ揺動させ、テンションワイヤや供給装置60から供給されるワイヤ61により整列巻線する。なお、図1では図示を省略するが、ワイヤ61を一時保持するグリッパやワイヤ61を巻線位置に導くワイヤガイド等も設けられている。

【0016】次に、上記のような構成からなる巻線装置を用いた固定子の製造方法を図4乃至図14を参照して説明する。まず、図1の揺動装置50により右行端に揺動させたホルダ部材31に、図4に示すようにW相を構成する1相分の第3、第6、第9、第12分割固定子3、6、9、12をスロット側であるティース部を外側にして装着し、テンションワイヤや供給装置60から供給されるワイヤ61の直角に折り曲げた巻き始め線を、最

初に巻線する第12分割固定子12の収納溝12dを経てワイヤクランパ32aに預けて図5に示す状態とする。

【0017】この状態から、図6に示すように、回転部材41によりホルダ部材31を介して第12分割固定子12を軸線Xの回りに回転させながら、揺動装置50によりホルダ部材31を左方へ揺動させてティース部12bにコイルを形成する。巻線が終了すると、巻き終わり線を収納溝12eを経てワイヤクランパ32aに預けて渡り線を形成する。

【0018】その後、ホルダ部材31を不図示のインデックス回転機構により時計方向へ90度回転させ、2コイル目の第9分割固定子9を巻線位置に移行させ、その巻き始め線（渡り線）をワイヤクランパ32bを経て収納溝9dに預ける。これに並行して、図1に示した揺動装置50によりホルダ部材31を介して第9分割固定子9を右行端へ揺動させ、2コイル目の巻線態勢を整える（図7参照）。

【0019】以下、同様の巻線手順を繰り返し、順次第9、第6、第3分割固定子9、6、3の巻線を行い、4コイル目の第3分割固定子3の巻線が終了すると、すなわち、w相1相分の巻線が終了すると、巻き終わり線を収納溝3eを経てワイヤクランパ32dに預けて切断する（図8参照）。

【0020】この状態で、W相の第3、第6、第9、第12分割固定子3、6、9、12とその各渡り線及び口出し線（巻き始め線及び巻き終わり線）の形状並びに配置を崩すことなく第3、第6、第9、第12分割固定子3、6、9、12をホルダ部材31から取り外して図9に示す状態にする。

【0021】同様にして残り2相分、V相及びU相を構成する第2、第5、第8、第11分割固定子2、5、8、11及び第1、第4、第7、第10分割固定子1、4、7、10のコイルを作成し、図10及び図11に示すようにW相の分割固定子の上にV相及びU相の分割固定子を順次積層する。このとき、第1～第12分割固定子1～12の順の相隣る分割固定子の軸線がそれぞれ30度の角度で交わり、且つ、各分割固定子の鉄心が互いにほぼ接する状態とする。

【0022】また、図11に示すように、各相の分割固定子の巻き始め及び巻き終わりの口出し線及び渡り線の固定子軸方向（紙面に垂直な方向）の位置が鉄心に近いものから順次積み重ねる。すなわち、W相（3、6、9、12）の上にV相（2、5、8、11）を、その上にU層（1、4、7、10）を積層する。

【0023】次いで、積層した分割固定子を固定子軸に垂直な平面（紙面に平行な平面）に沿って図12に示すように一直線上に展開する。これにより、上段に積層されたU相の渡り線61uは、図13に示した各分割固定子1～12の上段の収納溝1f～10fに、V相、W相

の渡り線61v, 61wは中段及び下段の収納溝2g~11g, 3h~12hにそれぞれ対向し、図14に示すように、鉄心部を外周側にして、すなわち、オープンスロット側を内側にして固定子軸Cを中心として円周状に丸めることにより、それぞれの段の収納溝内に収納されて相間絶縁を容易にする。

【0024】なお、上記の実施形態では各分割固定子とその軸線の回りに回転させることによりコイル巻線を行うようにしたが、分割固定子を固定し、フライヤを旋回させることによりコイル巻線を行う場合でも、何等支障なくこの発明を実施することが可能である。

【0025】

【発明の効果】以上述べたように、この発明による固定子の製造方法によれば、同一相を構成する分割固定子間の渡り線を切断することなく連続して巻線することができ、従来の面倒な各相毎の渡り線の結線が不要になり固定子の生産性を大幅に向上させることができる。

【0026】そして、上記の固定子の製造方法において、積層した各相毎の渡り線の固定子軸線方向の位置をそれぞれ異ならせるようにすると、各相毎の渡り線の整理が容易になり、各相間の渡り線の絶縁も容易になる。

【0027】また、この発明による固定子の製造装置によれば、きわめて簡単な構成で各相毎の渡り線を切断することなく、全て連続して巻線を行うことができるため、結線に伴う製造工数を大幅に減少させることができる。

【0028】そして、上記の固定子の製造装置において、ホルダ部材に口出し線及び渡り線を保持可能なクランプ部を設けたものは、各相毎の口出し線及び渡り線の位置決めを一層容易にしてさらなる固定子の生産コスト低減を図ることができる。

【図面の簡単な説明】

【図1】この発明による固定子の製造装置の一実施形態を示す構成図である。

【図2】図1に示した製造装置により巻線される分割固定子の一例を示す平面図である。

【図3】同じくその側面図である。

【図4】1相目の分割固定子をホルダ部材に装着した状態を示す平面図である。

【図5】最初の分割固定子への巻線準備状態を示す平面図である。

【図6】最初の分割固定子の巻線状態を示す平面図である。

【図7】2番目の分割固定子の巻線準備状態を示す平面図である。

【図8】1相目の分割固定子の巻線終了状態を示す平面図である。

【図9】1相目の巻線終了した分割固定子をホルダ部材から取り外した状態を示す平面図である。

【図10】1相目と2相目の分割固定子を積層した状態を示す平面図である。

【図11】1相目、2相目、3相目の分割固定子を順次積層した状態を示す平面図である。

【図12】図11に示した各分割固定子を一直線上に展開した状態を示す平面図である。

【図13】同じくその側面図である。

【図14】図11及び図12に示した各分割固定子を固定子軸線の回りに丸めた状態を示す平面図である。

【符号の説明】

1~12：第1~第12分割固定子

1a~12a：鉄心部 1b~12b：ティース部

1c~12c：インシュレータ

1d~12d, 1e~12e, 1f~12f, 1g~12g, 1h~12h：収納溝

20：固定子

30：分割固定子保持手段

31：ホルダ部材 32a~32d：ワイヤクランプ

33：インデックス軸 40：巻線用の回転手段

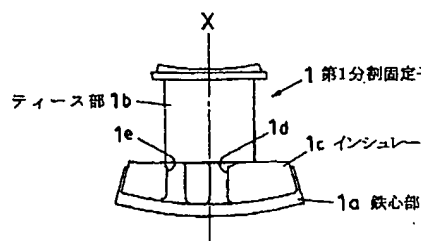
41：回転部材 42：巻線装置

43：巻線モータ 50：揺動装置

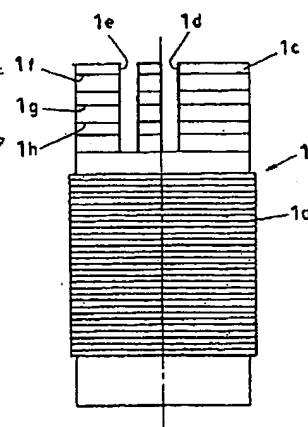
60：テンションワイヤ供給装置

61：ワイヤ 61u, 61v, 61w：渡り線

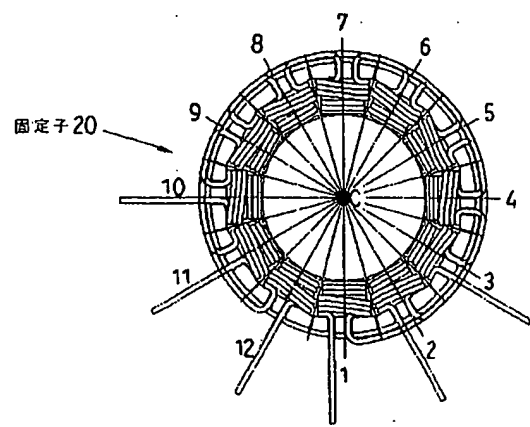
【図2】



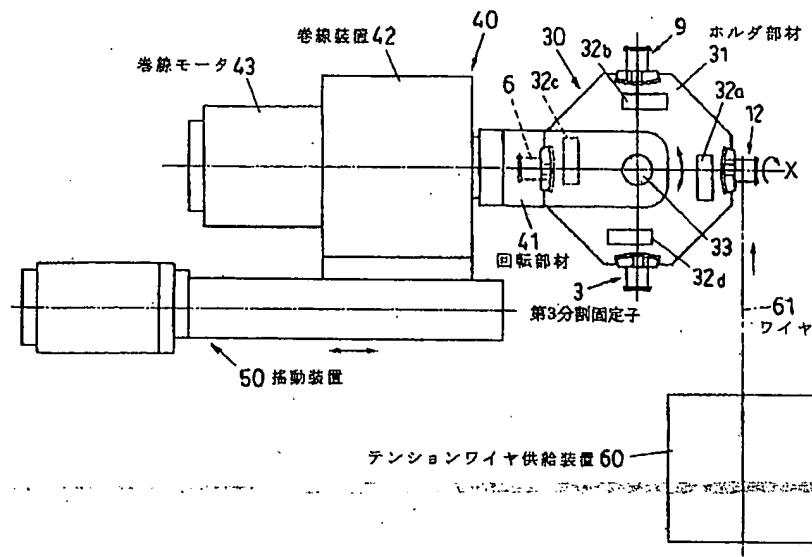
【図3】



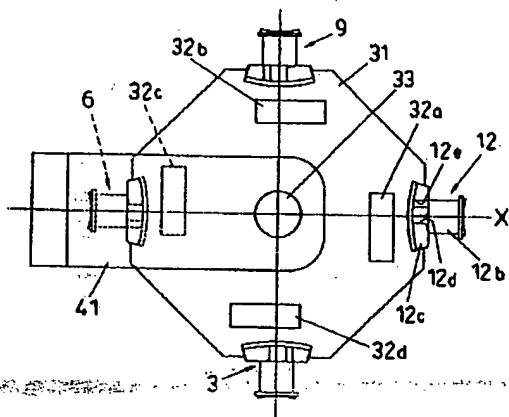
【図14】



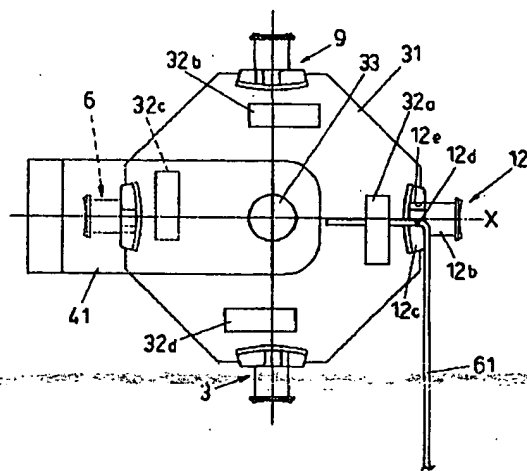
【図1】



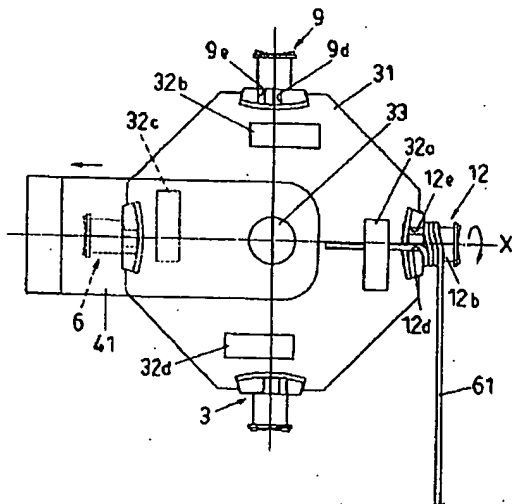
【図4】



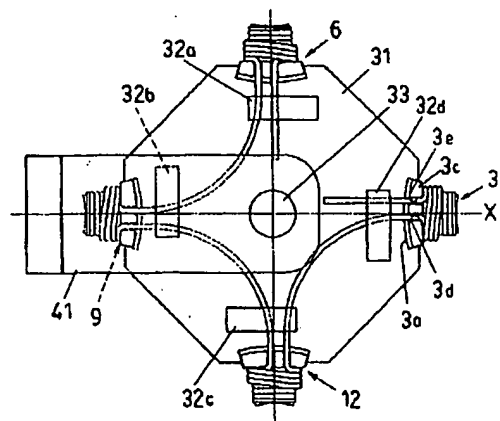
【図5】



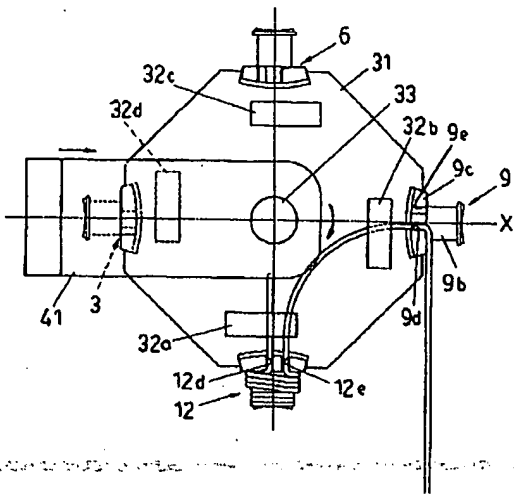
【図6】



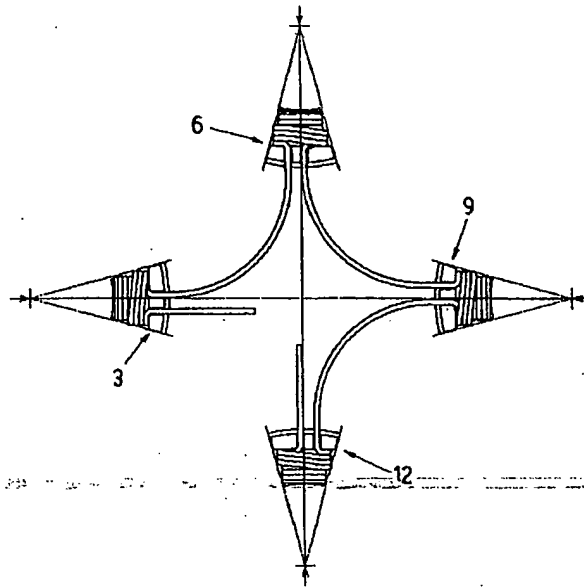
【図8】



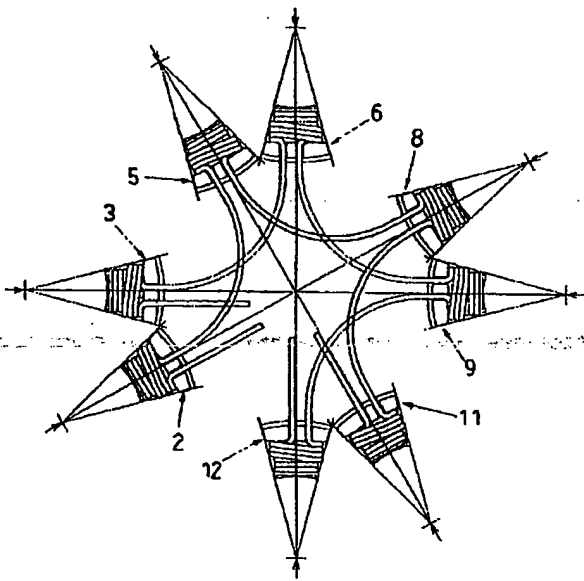
【図7】



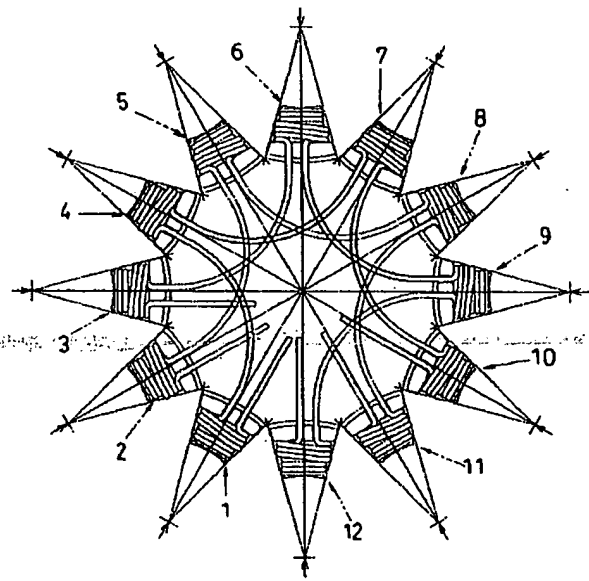
【図9】



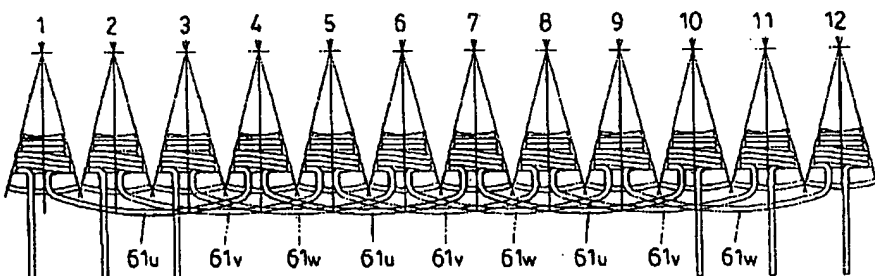
【図10】



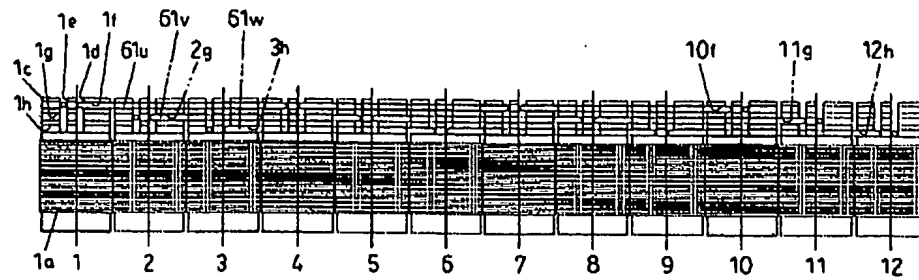
【図11】



【図12】



【図13】



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